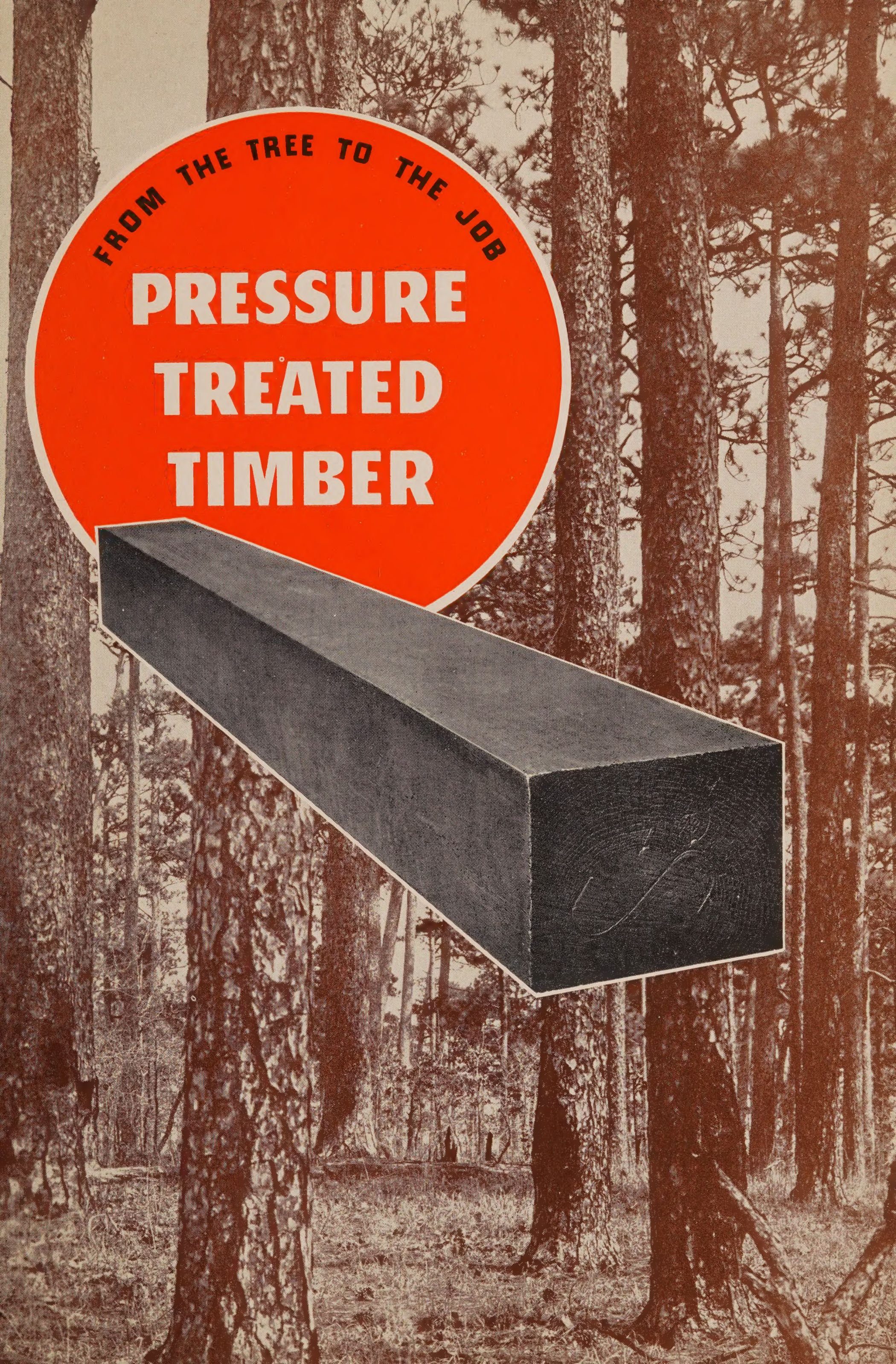

FROM THE TREE TO THE JOB

PRESSURE TREATED TIMBER

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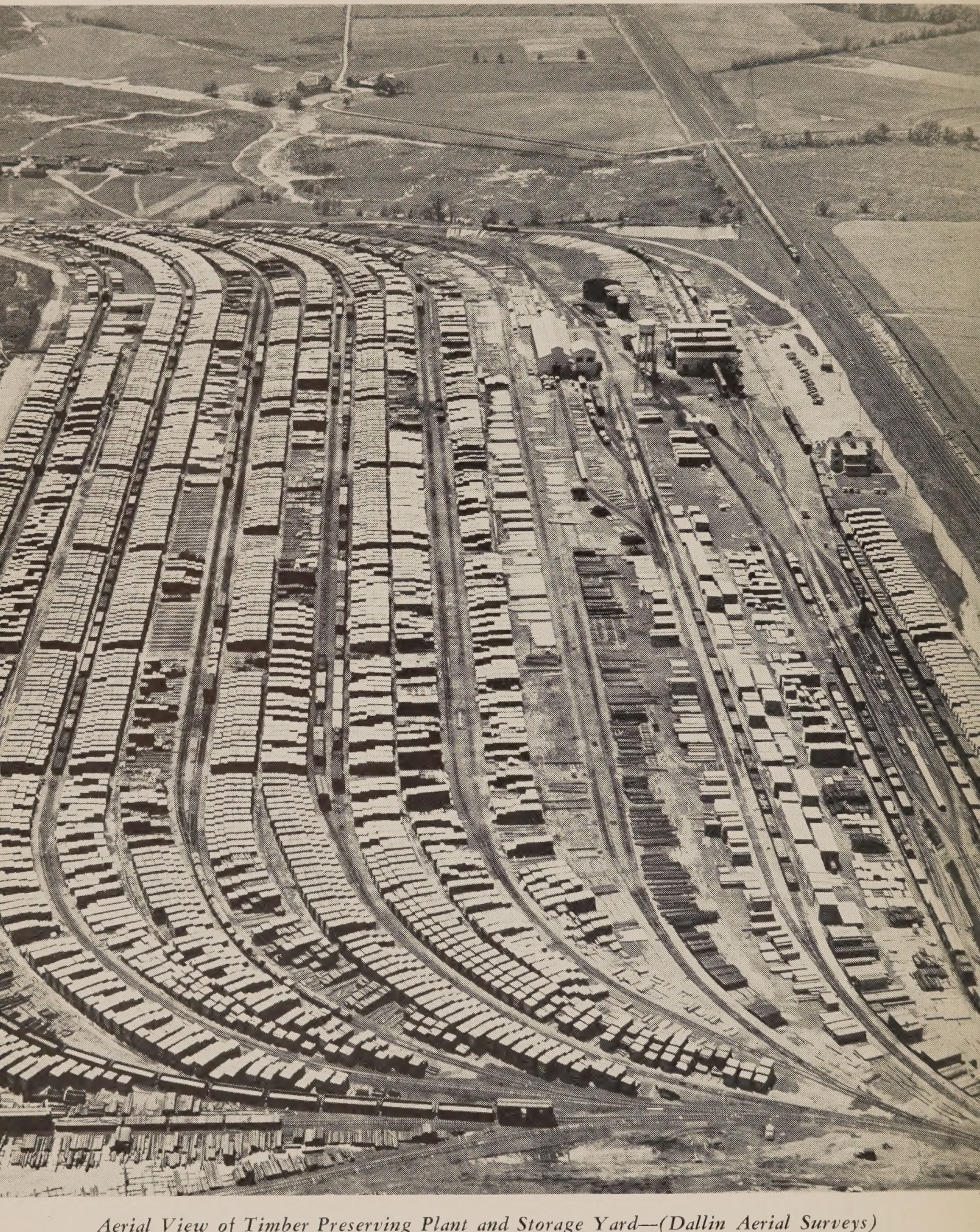
Correct Pressure Treatment renders the less expensive and the less durable species of wood suitable for maximum service by protecting them against Decay and Insect Attack.

Some of the Important Savings which result from the use of Treated Wood, together with simple rules for estimating the value of pressure treatment in particular installations are set down on the following pages.

THE WOOD PRESERVING CORPORATION



Aerial View of Timber Preserving Plant and Storage Yard—(Dallin Aerial Surveys)

WOOD PRESERVATION

A brief description of this interesting process; why it is necessary; how it is done; and the different kinds of preservatives employed.

Wood preservation protects timber against attack by decay, insects and marine borers. This protection is accomplished by pressure treatment with preservative oils or chemicals. To reduce mechanical wear, preservatives of an oily nature, such as CREOSOTE, offer effective results.

Because wood is subject to the attacks of decay and insects, its service life may be shorter than desired. To provide practically permanent life is the purpose of wood preservation: thus by providing increased life, the most common objection to the use of wood for structural projects is eliminated. The Wood Preserving Corporation maintains a technical staff which continually carries on research work to determine the best methods for preserving wood.

Decay of timber is caused by low forms of plant life called "fungi," which feed on wood cellulose, thus destroying it. Warmth, air, moisture and food are the elements required by these fungi for growth. Generally it is not possible to control the first three of these sustaining elements; therefore, protection against fungi is brought about by poisoning their food supply.

The Wood Preserving Corporation does this by injecting into the wood, under pressure, approved preservative oils or chemicals. These preservatives must not only be poisonous to fungi, but they also must possess a high degree of resistance to evaporation and leaching from the wood.

Termites are the most commonly known and the most destructive of wood destroying insects. Usually, the wood preservative treatments that are effective against decay are effective also against such insects.

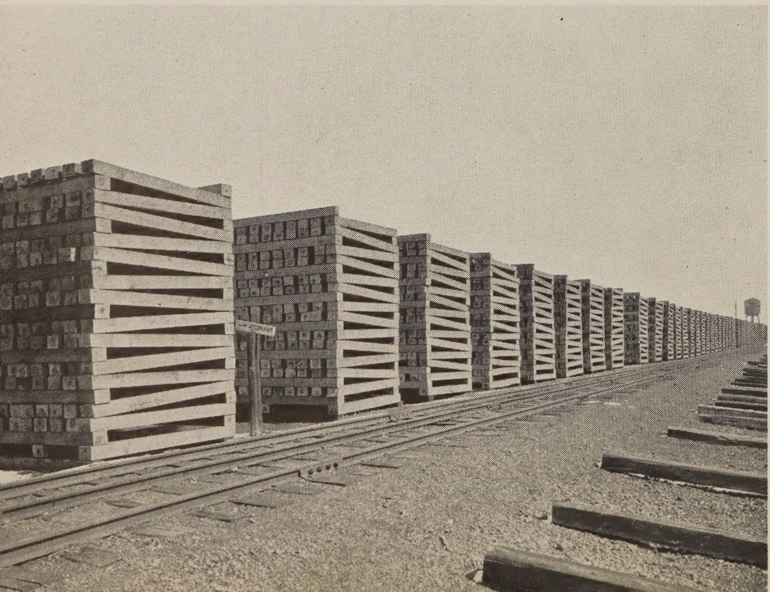
Marine Borers, the most common of which are the *Teredo* and the *Limnoria,* attack and destroy wood submerged in salt water.

They use the wood substance for shelter only (not for food). For this reason, protection against Marine Borers presents difficulties greater than in the case of decay or those types of insects which feed on the wood. The only effective method is a heavy treatment, under pressure, with coal tar CREOSOTE.

The distillate CREOSOTE, made from coke oven tar, is the most effective preservative of wood against both decay and insects. It is also by far the most widely used. In the year 1935, the U. S. Department of Agriculture reported a total of 179,438,970 cubic feet of wood treated. Of that total, 169,265,838 cubic feet, or approximately 94 per cent, were treated with CREOSOTE or with CREOSOTE mixtures.

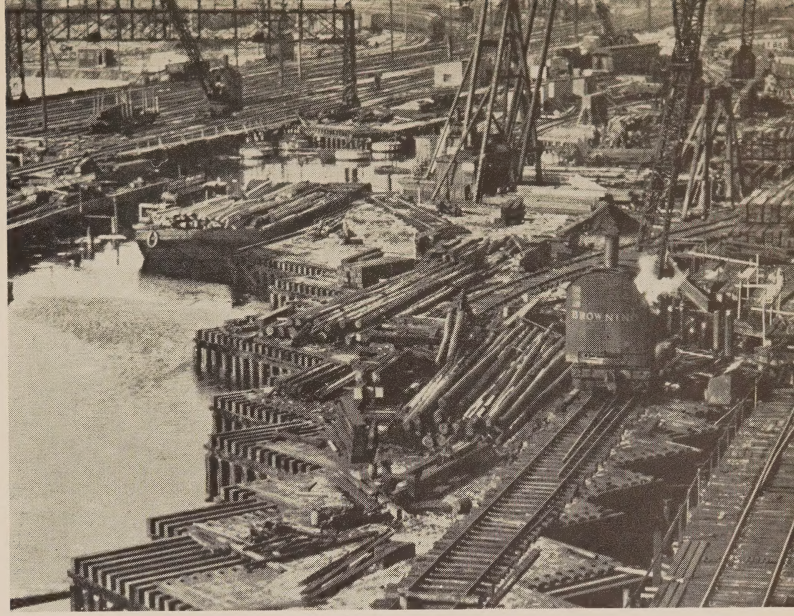
Volumes of data, gathered over many years of experience, prove the value of CREOSOTE as a preservative. Pressure creosoted poles, piling, ties and various types of pressure creosoted structures are now in service after 30, 40 and more years of useful life. Efficient treatment of timber with CREOSOTE also reduces mechanical wear, eliminates the necessity for painting, and greatly reduces the maintenance cost in comparison with other construction materials.

While CREOSOTE treatment is best suited for most purposes, there are instances where color, odor and paintability of the wood must not be appreciably changed. In such cases, preservative treatment, under pressure, is made with chemical solutions which do not alter the physical characteristics of wood. Where used above ground, such chemically treated wood has given very satisfactory results. Proper pressure treatment with chemical solutions, such as CHROMATED ZINC CHLORIDE and WOLMAN SALTS, is available at several plants of The Wood Preserving Corporation, where facilities are maintained for the proper drying, framing and clean treatment of the timber. Inasmuch as the chemical treatment of wood is not as general as CREOSOTE treatment, one contemplating the use of such material in construction and repair work should consult a sales engineer of The Wood Preserving Corporation, who will specify the proper treatment to be given.



Railroad Ties in Storage for Air Seasoning in Treating Plant Yard

Pressure Treated Piling and Timber Being Installed in Railroad Terminal



PRESSURE PROCESSES USED IN TIMBER PRESERVATION

The effects of various processes employed by The Wood Preserving Corporation; and how the purchaser is assured of treated wood that will give maximum life.

In order for wood preservatives to be effective, they must penetrate well into the wood. Surface applications by brush, spray or dipping are not effective, because the penetration obtained is slight and the penetrated shell soon is broken through by subsequent checks or abrasions. The untreated wood beneath the surface then is exposed to decay or insect attack, and the purpose of the treatment is defeated.

The Wood Preserving Corporation uses pressure processes for applying the preservative. This pressure treatment secures the penetration required for effective and dependable protection giving maximum service life of the wood.

Pressure treatment is of two general types: the Full-cell and the Empty-cell. The former is sometimes referred to as the Bethell Process, while the latter may be either the Lowry or the Rueping Process.

As the name implies, the object of the Full-cell process is to leave the cells of the wood filled with preservative, which is retained in maximum quantity.

The purpose of the Empty-cell process also is to obtain deep penetration by injecting, under pressure, large quantities of preservative. Any surplus preservative, however, is recovered through expansion of air imprisoned in the wood by operating methods employed in this process. Thus, the principal difference in finished products treated by the two types of processes is the smaller quantity of preservative retained in the Empty-cell treated timber.

The type of process to be used in any one case, and details of its application, depend upon both the species of timber and its state of seasoning, as well as the purpose for which the timber is to be used. Long experience and careful technical supervision, together with proper equipment for controlling temperatures, pressures and volumes, are necessary to assure the correct treatment of any kind of timber.

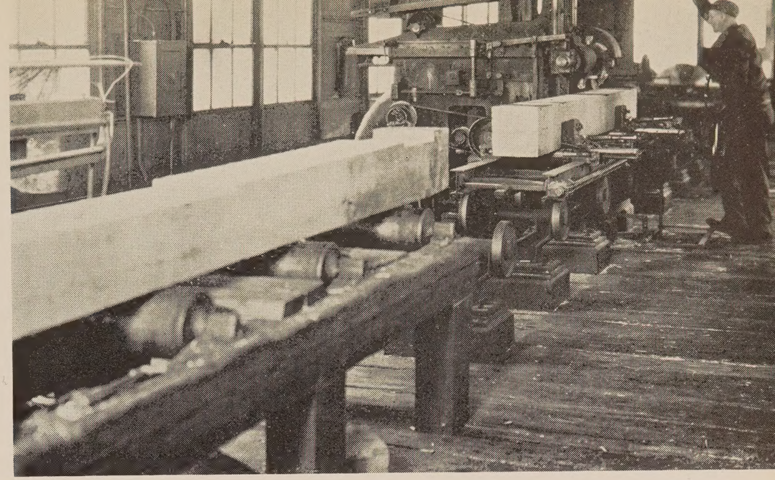
PREPARATION OF TIMBER BEFORE TREATMENT

Some practical suggestions for obtaining full satisfaction and more lasting service from treated wood.

While the penetration of the preservative into wood treated under pressure is adequate for protection against internal decay, complete penetration of all species of timber is not possible. Therefore, if timber is cut after treatment, there is danger of exposing the untreated portion to attack by decay or insects. For this reason all adzing, boring, chamfering, framing, gaining, mortising, surfacing, etc. should be done before treatment.

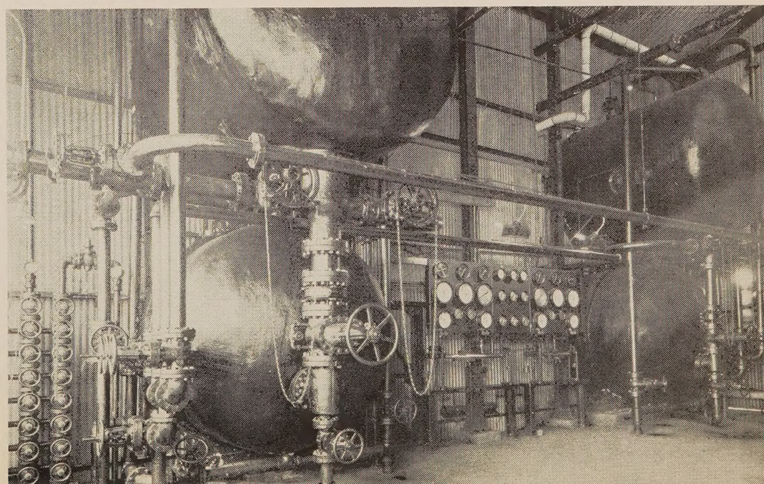
Plants of The Wood Preserving Corporation are equipped with modern wood working machinery with which all fabrication can be done economically. The common practice is for the user to furnish sketch or blueprint giving the dimensions required for proper sizing and framing of the timber. Experience has shown that, in most instances, it is not only practical but more economical to have timber worked at the treating plant, where operating conditions are more favorable than in the field.

When the cutting of treated timber on the job is unavoidable, all newly exposed surfaces should be given two coats of hot CREOSOTE.



Timber Being Fabricated Before Treatment

Timber Ready for Pressure Treatment



Control Valves and Gauges in Rear of Pressure Treating Cylinders

ECONOMY OF TREATED TIMBER FOR INDUSTRIAL PLANTS

Some of the important savings resulting from use of treated woods; together with their advantages over other structural materials, and a convenient method for estimating savings on particular construction projects.

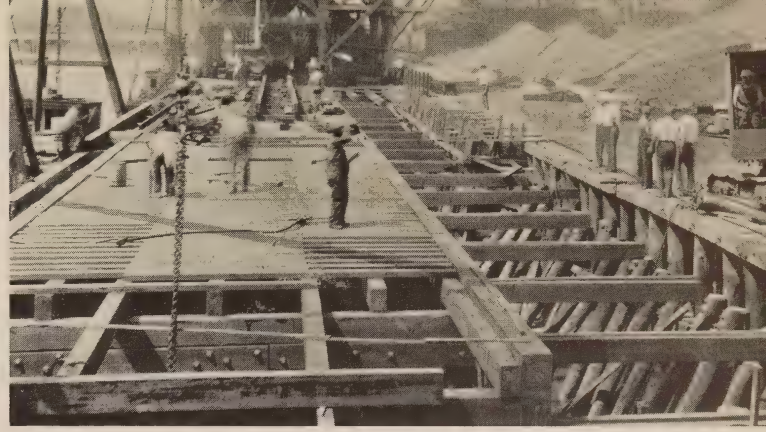
Actual experience and service records of railroads, extending over many years, prove that treated timber has a life far greater than untreated—and that treatment of ties, trestles and other track structures is definitely an economic necessity.

The 26th Annual Report of the Chicago, Burlington and Quincy Railroad, for example, covers ties in certain sections and shows actual service of 21.8 years already established by CREOSOTED ties of all species, compared to about 5½ years' life for similar untreated ties. The Burlington estimates the average life of these CREOSOTED ties at 27 years. Further, the lowest cost species of wood, when treated, showed much greater life than untreated wood of the more costly or so-called durable species.

This experience record was obtained from main line tracks, where ties are subject not only to decay, but also to mechanical wear. Where mechanical wear is not so much a factor, as in the case of industrial plant tracks, the extension of service life is even greater. Similar savings

Pressure Treated Piling being used in Dock Construction

Wharf Construction with Pressure Treated Timber



on replacement costs are effected by the use of treated timber for any type of construction where untreated wood is subject to attack by decay or insects.

Again, where other structural materials are subject to corrosion and to consequent high maintenance costs worthwhile economies are effected by the use of treated wood; provided of course, timber is otherwise suitable as a structural material. Wood preserved with CREOSOTE requires no painting or other maintenance; and it has an additional advantage in that it undergoes no appreciable expansion or contraction with changes in temperature.

Under certain conditions it has been the practice to specify for timber a large percentage of heartwood content, in order to obtain longer life from untreated wood. Due to the increasing scarcity of this grade of lumber, it is steadily becoming more costly. Also, heartwood is not any stronger than sapwood, as stated in Technical Bulletin No. 479 of the U. S. Department of Agriculture: viz.

> "In the many tests which have been made on the various species of wood, no effect upon the mechanical properties of most species due to change from sapwood to heartwood has been found. In general, the conditions of growth that prevail when wood is first formed determine its strength properties; and whether heartwood or sapwood is the stronger depends on those conditions. Conse-

Pressure Treated Plank Decking on Pier

> quently, in one tree the heartwood may excel; and in another of the same species, the sapwood. Thus the heartwood of the Southern pines and of Douglas fir is not, as has often been supposed to be the case, intrinsically stronger than the sapwood."

While heartwood is more resistant to decay, it is not as readily penetrated by a preservative. Moreover, pressure treated sapwood is more durable than untreated heartwood; and the longer life given by deep penetration makes it desirable to have treated timber with a large content of sapwood. Thus, less expensive grades of lumber can be used instead of the more costly heartwood.

Structures of treated wood also have the advantage of being easily and economically altered or remodeled for required changes in use. Further, if the structure is no longer required, the preserved timber is readily salvaged for useful life elsewhere. The fire hazard, also, is no greater with creosoted wood than with untreated lumber; and it is definitely less after the treated wood has been in service for some time.*

The economy of using treated timber may be estimated readily by using the following table, if the approximate life values and costs of structures of untreated wood or other materials are known.

This table shows the annual charges per dollar of cost of the construction material in place, where the interest rate is 6%. The labor cost of installing timber, both treated and untreated, must be added to the timber cost before the annual charges can be properly calculated.

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*Proceedings American Wood-Preservers' Association—1933, P. 55

The figures do not include maintenance costs. Creosoted wood ordinarily requires no maintenance or painting, whereas untreated wood usually does. If painting or other maintenance is required, that annual cost per dollar of investment must be added to the charges in the table.

ANNUAL CHARGES ON EACH DOLLAR OF COST OF TIMBER IN PLACE WHERE INTEREST RATE IS 6 PER CENT

Years of Life before Replacement	Annual Charges	Years of Life before Replacement	Annual Charges
1	1.060	17	.095
2	.545	18	.092
3	.374	19	.090
4	.289	20	.087
5	.237	21	.085
6	.203	22	.083
7	.179	23	.081
8	.161	24	.080
9	.147	25	.078
10	.136	26	.077
11	.127	27	.076
12	.119	28	.075
13	.113	29	.074
14	.108	30	.073
15	.103	40	.066
16	.099	50	.063

The life of creosote pressure-treated wood may be estimated at a minimum of 25 years for the average industrial plant use. The average life of untreated wood for uses such as railroad ties is usually not over five years. The economy of using creosoted wood is illustrated by the following example:

> If an untreated oak cross tie having a life of 5 years costs $1.40 in track and a creosoted oak cross tie having a life of 25 years costs $2.00 in track, the annual charges from foregoing table are as follows:

Untreated Tie	$ .3318
Creosoted Tie	.1560
Saving per tie per year	.1758
Saving per tie for the 25 year period	$4.395

When the true relative costs and life values of creosoted wood and alternate materials are used, it is obvious that large savings are possible.

Creosoted Railway Timber Trestle

Creosoted Tramway Cable Tower

Creosoted Wooden Tank and Supports

ECONOMY OF TREATED TIMBER UNDER GROUND IN COAL MINES

Important facts on savings which result from use of treated timber in mines, based on definite records compiled by The Wood Preserving Corporation.

Generally, untreated timber used in coal mines has only half the resistance to decay offered by the same timber in surface use, though there are some exceptions to this rule. Untreated mine timber, continuously wet, has been known to give long service in fresh air; but in locations which are dry or alternately wet and dry (and particularly in return air), untreated mine timber rapidly fails from decay. This is a natural result, because the uniform temperature in coal mines is always favorable to the growth of fungi; and their spores are carried throughout mine openings by air currents.

The absence of sunlight, rain and freezing temperatures contributes to the long life of creosoted mine ties and mine timbers. Creosote also is not affected by mine water and, after some months of service, creosoted wood is more difficult to ignite than untreated wood. Salt treated timbers are available for use where service conditions indicate they would be more desirable than a creosoted product.

Economies developed by railroads and public utilities from the use of creosoted timber furnished by The Wood Preserving Corporation are a matter of record, as are also the greater savings shown by mine use of treated timber. The labor cost of installing timber under ground is several times more than on the surface; and the short life of untreated timber in mines makes this labor cost an important factor in the economies resulting from use of timbers properly treated to give long and satisfactory service.

Pressure Treated Main Haulage Mine Ties

Salt Treated Sub-flooring laid on Creosoted Stringers and Nailing Strips

USES OF TREATED TIMBER IN INDUSTRIAL PLANTS

Treated timber can be used profitably for new construction or repair wherever timber is a suitable building material. The kind of wood best adapted to specific purposes depends upon both the requirements of the job and the availability of various species.

For example: Southern pine, Douglas fir, and oak are suitable materials for round piles. In the Eastern part of the country, however, Southern pine is most abundant in the sizes normally required, and it is used to a much greater extent than the other species mentioned.

Since local conditions of supply and use may alter the recommendations for timber, it is advantageous to consult the treating plant before any particular species or grade of wood is specified. Engineers of The Wood Preserving Corporation will gladly assist in formulating specifications for both the material and its treatment.

For structural timbers, Southern pine, oak and Douglas fir are suitable. Purchase may be based on price, if no unusual requirements exist.

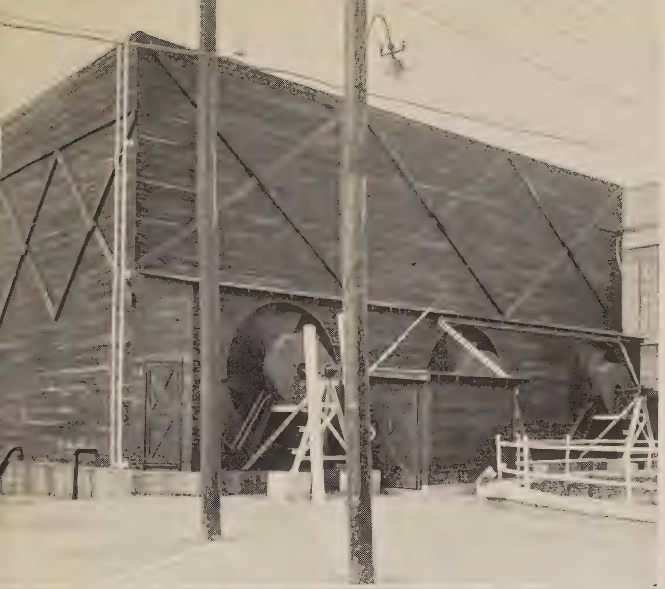
For small structural lumber, siding, roofing, etc., Southern pine is generally best suited. It is easily nailed and not difficult to keep in place.

For platforms, crossing plank and similar installations where mechanical wear is severe, black gum is most desirable. The oaks and mixed hardwoods also will give satisfactory service.

For cross ties, switch ties, and bridge ties, any of the common species are used. The species generally used for industrial ties are the oaks, mixed hardwoods and Southern pine.

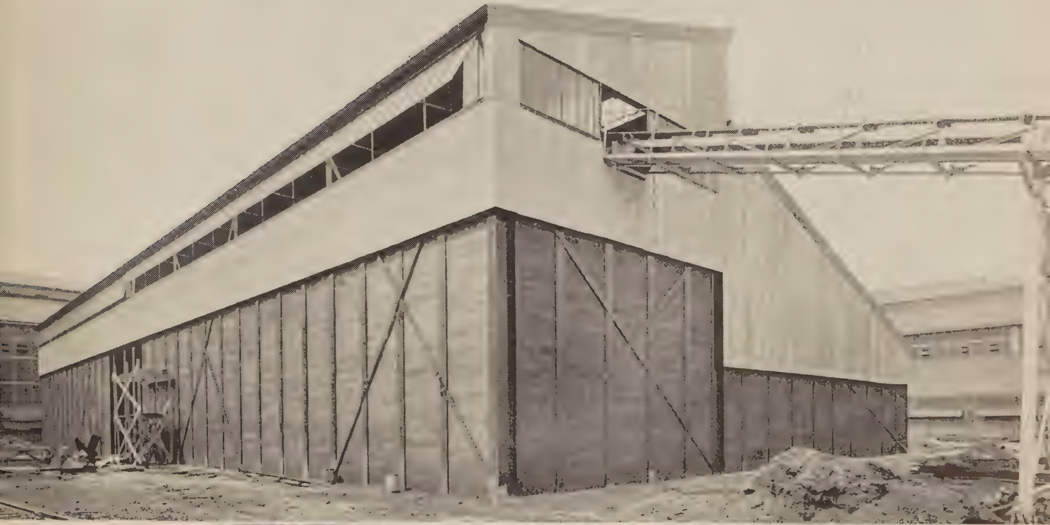
For cooling towers, coarse pine and Douglas fir are most suitable on account of their light weight.

For pressure CREOSOTED poles, pine is used almost exclusively.



Cooling Tower constructed of Creosoted Lumber

Below—Creosoted Lumber in Sand Storage Building Walls



Salt Water Barge Constructed throughout with Creosote Pressure Treated Pine Lumber

Among the many uses in which pressure treated woods are demonstrating their economy are:

1. Bridges, Trestles and Tipples
    - Bracing
    - Caps
    - Cribbing
    - Piling Foundations
    - Ribbon Guards
    - Stringers
    - Ties
    - Trusses
2. Buildings, Bins, Sheds
    - Columns
    - Doors
    - Flooring
    - Framework
    - Joists
    - Piling Foundations
    - Rafters
    - Roofing Plank
    - Siding
    - Sills
    - Sleepers
    - Stairs
    - Window Frames
3. Cooling Towers
    - Boards
    - Braces
    - Framework
    - Supports
    - Trays
4. Fences
    - Posts
    - Pickets
    - Rails
5. Piers, Docks, Wharves
    - Bracing
    - Caps
    - Floors
    - Piling Foundations
    - Posts
    - Railing
    - Walkways
    - Sheet Piling
    - Stairs
    - Stringers
6. Platforms
    - Flooring
    - Nailing Strips
    - Supports
    - Hand Rails
7. Sign Boards
    - Boards
    - Braces
    - Framework
8. Tanks, Sumps and Vats
    - Lagging for Insulation
    - Piling Foundations
    - Planks
    - Sills
    - Structural Timbers
    - Staves
    - Supports
9. Tracks
    - Cross Ties
    - Switch Ties
    - Crossing Plank
    - Third Rail Guards
    - Third Rail Ties
10. Miscellaneous
    - Barges, sides and bottoms
    - Cableways
    - Conduits
    - Cribbing
    - Cross Arms
    - Culverts
    - Manhole Covers
    - Flumes
    - Poles
    - Posts
    - Retaining Walls
    - Trench Lining and Covers
    - Conveyor Decking and Supports

Salt-treated Sub-flooring being laid over Pressure Treated Creosoted joists

Pressure Treated Highway Bridge

Stadium Seats, all material chemically treated with the exception of the Mudsills which are Pressure Treated with Creosote

Chemically Treated Timber in use in Paper Mill Roof

CONCLUSION

In all industry, there possibly are no greater opportunities to be "penny wise and pound foolish" than those offered by trying to save through use of untreated timber where treated timber should be employed. The advantages and economies of treated wood truly deserve every consideration as an important factor in your structural and maintenance program.

The Wood Preserving Corporation will be glad to give you the benefit of its research and experience in connection with your problems —all without obligation, of course.

Do not hesitate to call on our engineers. Consultation with them may point the way to important savings in your business—savings as great as those revealed in the records of hundreds of users throughout all industry.

The Wood Preserving Corporation, through its widely located treating plants and its ability to produce and supply timber of all kinds, is able to bring you the fullest measure of satisfaction and economy.

THE WOOD PRESERVING CORPORATION

THE
WOOD PRESERVING CORPORATION
KOPPERS BUILDING PITTSBURGH, PENNA.

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